

FIG. 1

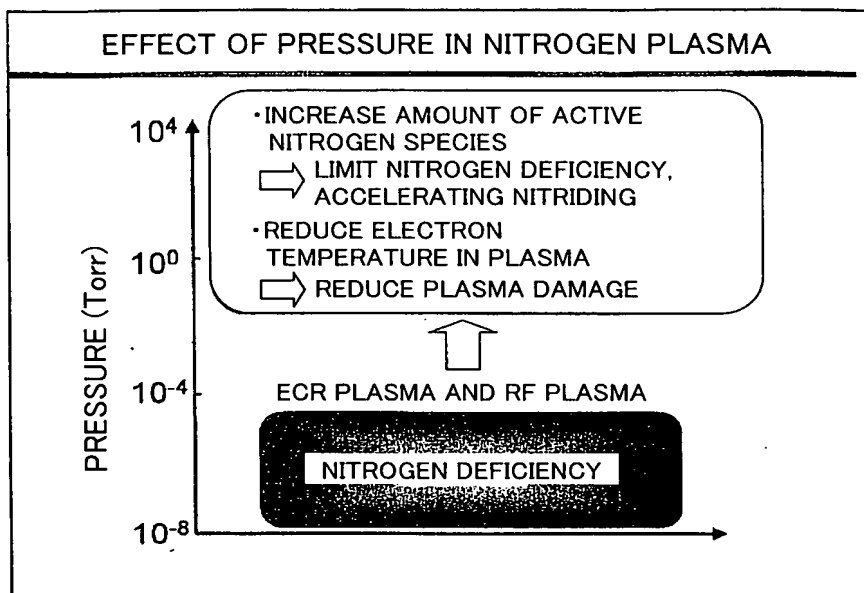


FIG. 2

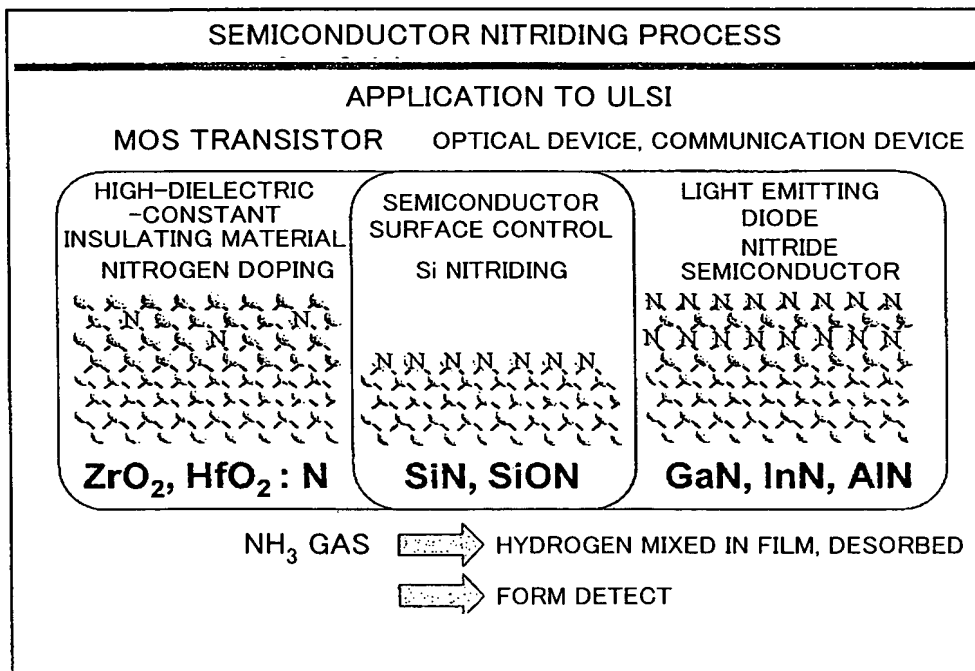


FIG. 3

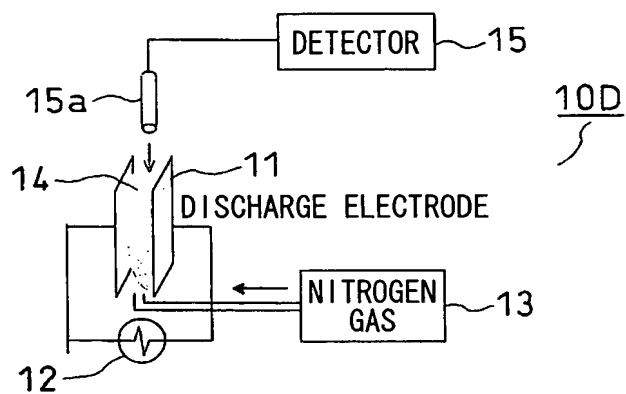


FIG. 4

45 Torr

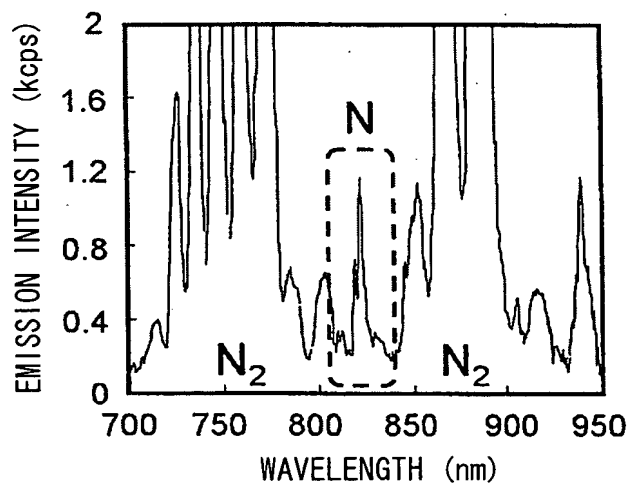


FIG. 5

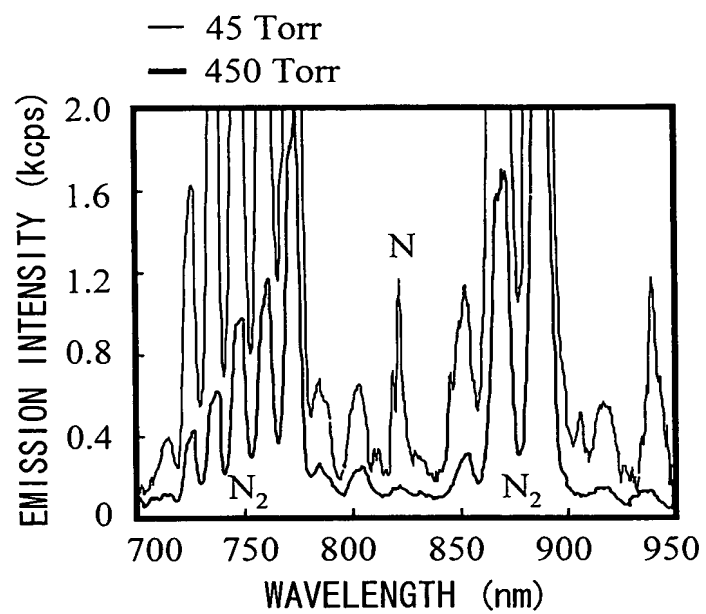


FIG. 6

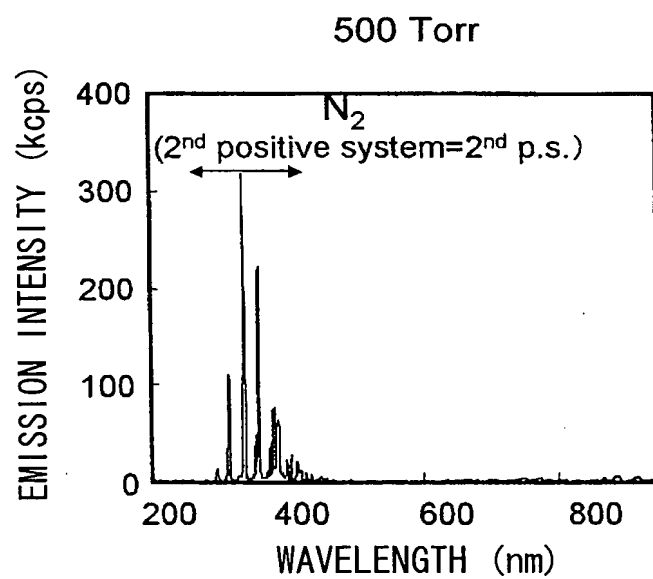


FIG. 7

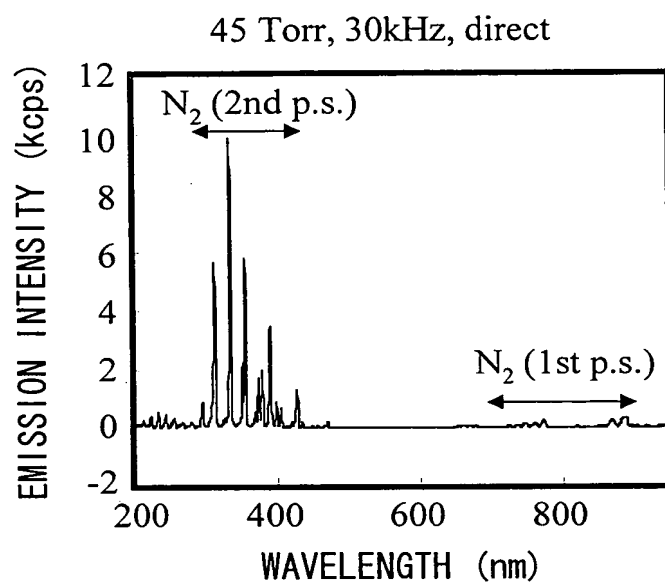


FIG. 8

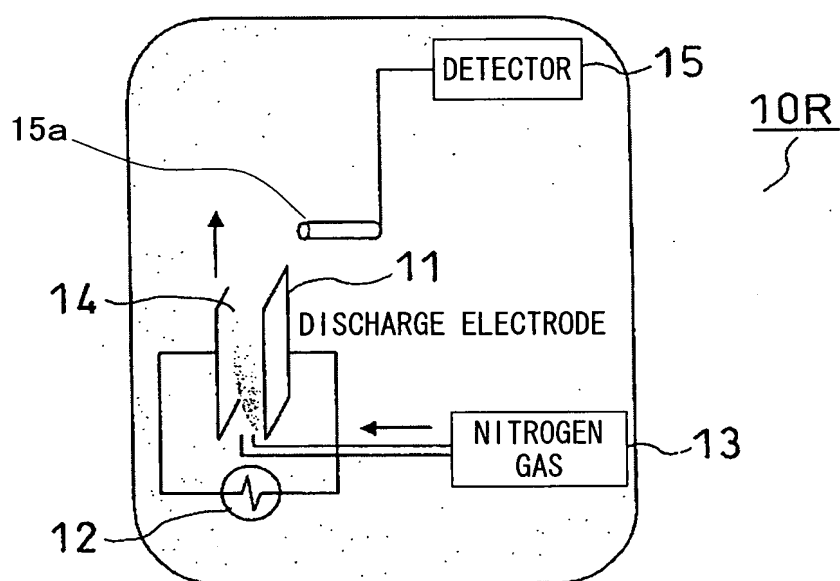


FIG. 9

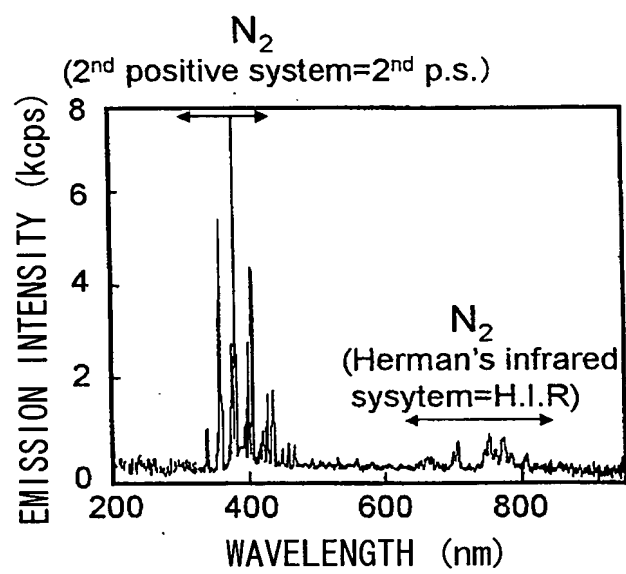


FIG. 10(b)

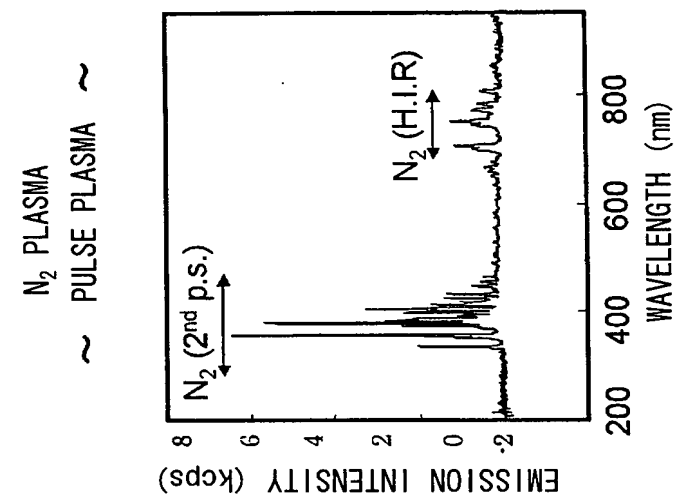
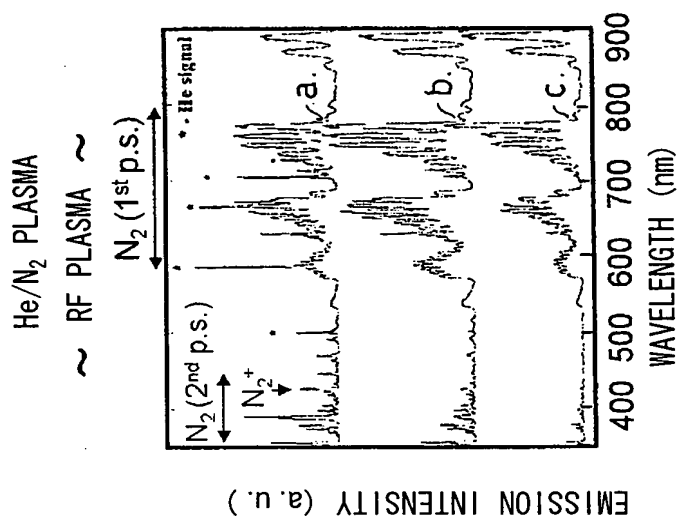
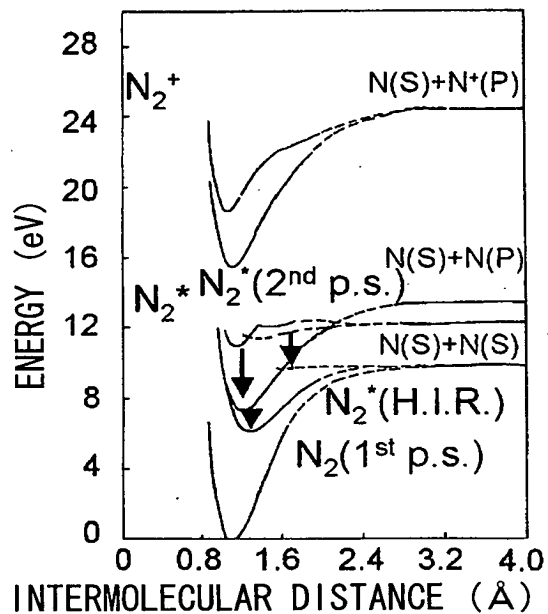


FIG. 10(a)



H. Niimi et al., J. Appl. Phys. 91, 48, (2002)

FIG. 11



A.N. Wright and C.A. Winkler, Active nitrogen
(Academic, New York, 1968)

FIG. 12

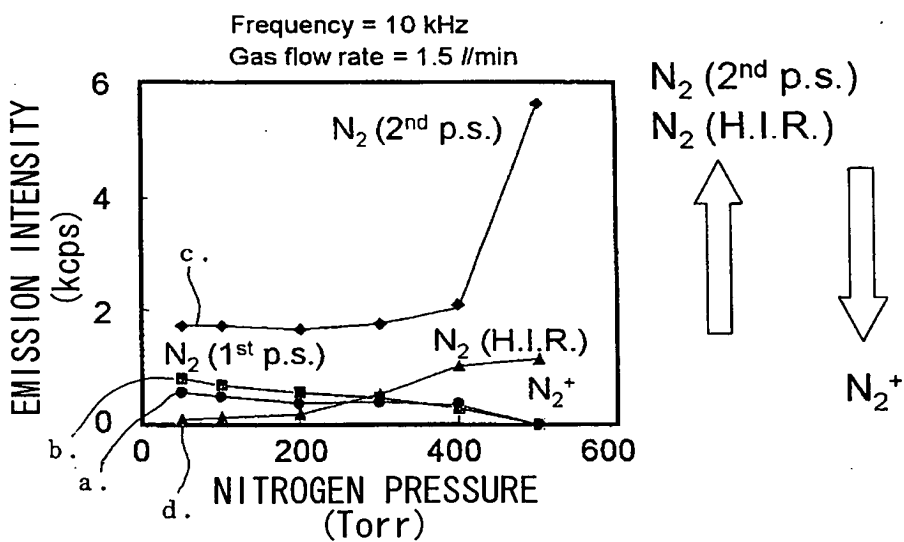


FIG. 13(b)

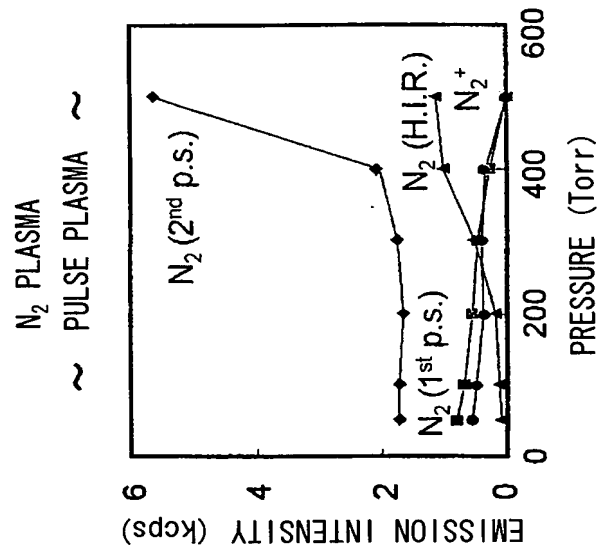
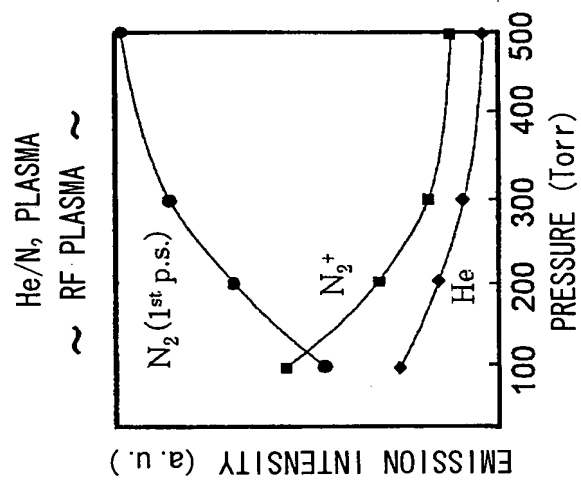


FIG. 13(a)



H. Niimi et al., J. Appl. Phys. 91, 48, (2002)

FIG. 14

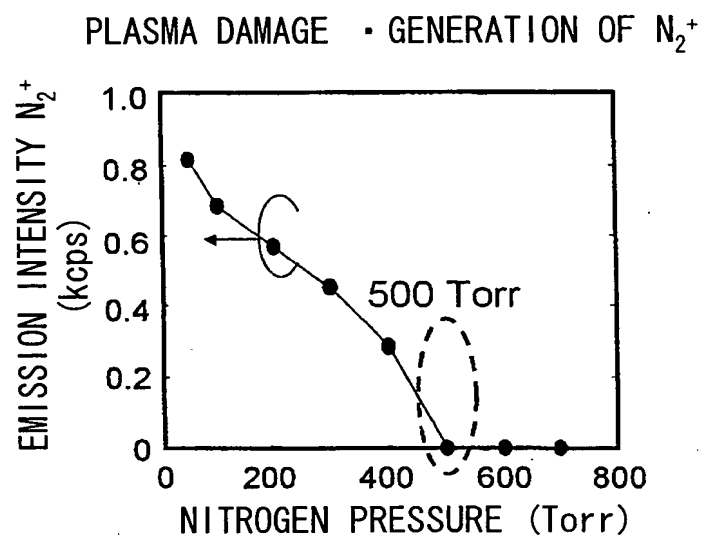


FIG. 15(a)

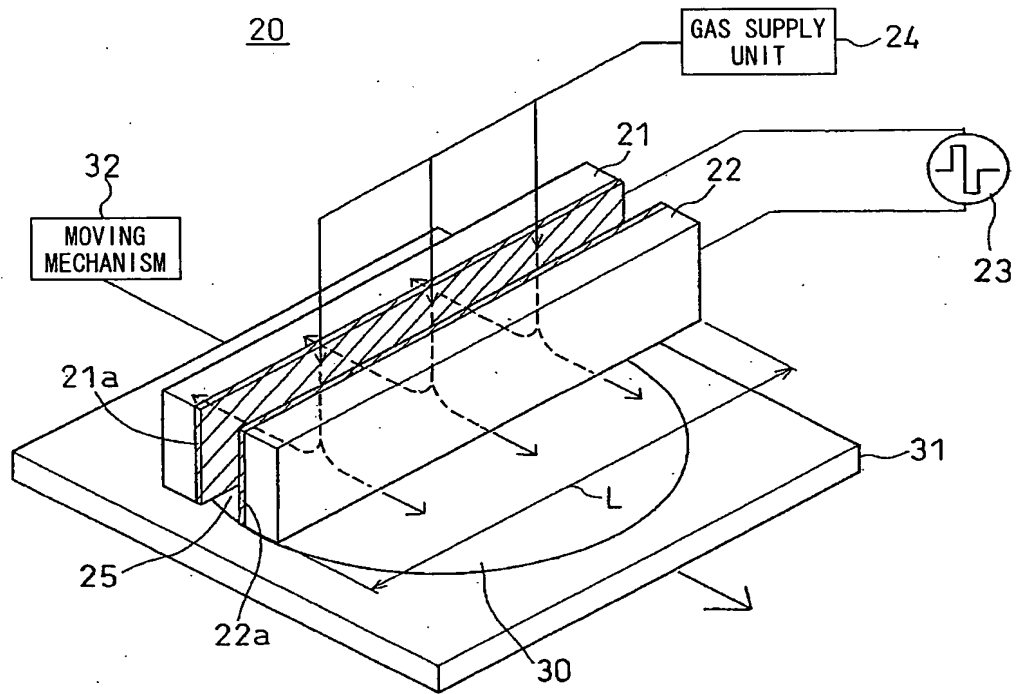


FIG. 15(b)

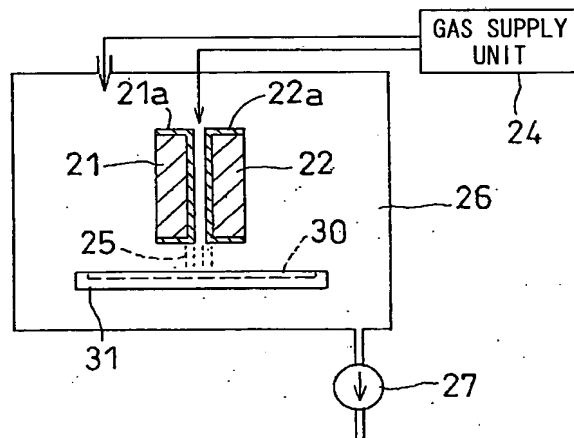


FIG. 16(a)

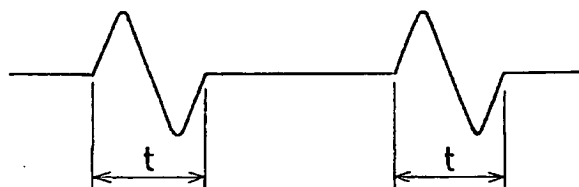


FIG. 16(b)

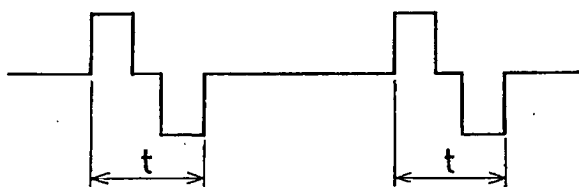


FIG. 17(b)

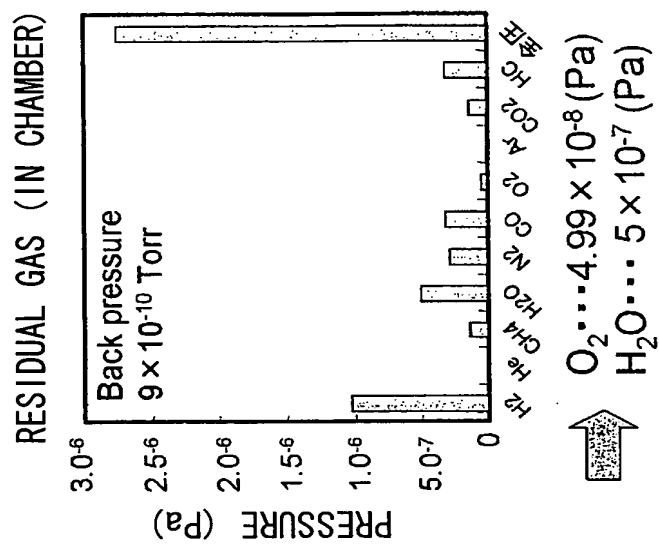


FIG. 17(a)

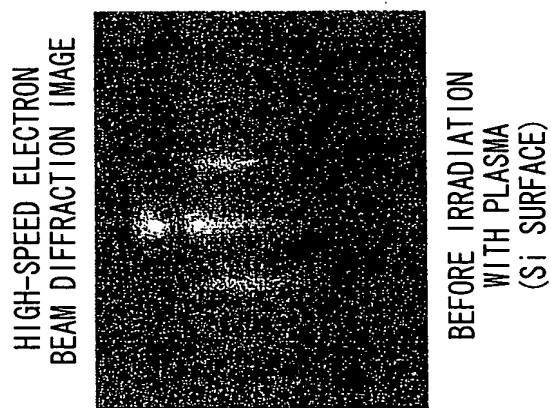
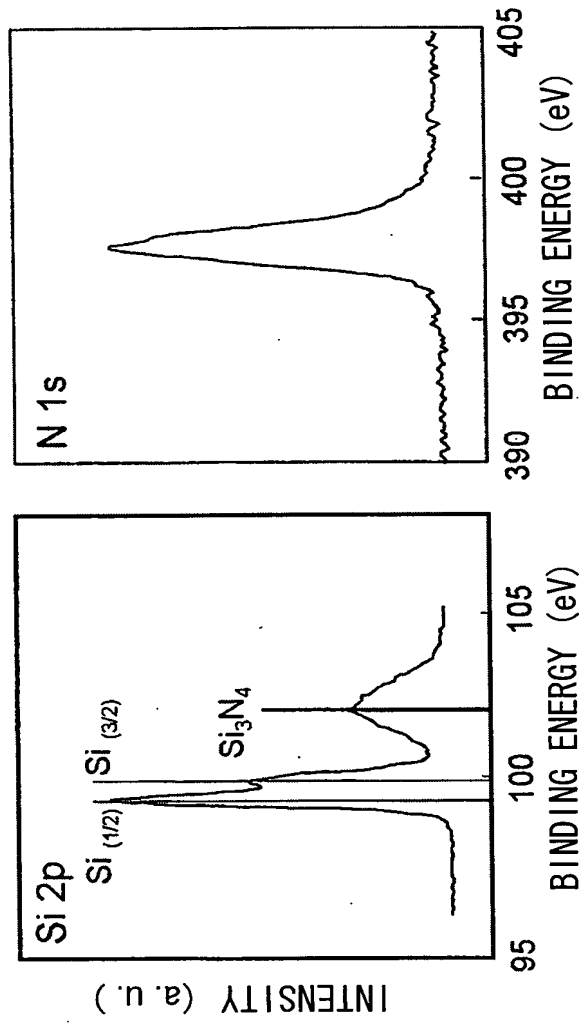


FIG. 18(a) FIG. 18(b)

HIGH-PURITY NITROGEN GAS : 99.9998%
 HIGH-PURITY GAS FILTER \Rightarrow H₂O, O₂ 1 ppb or less



\Rightarrow FORMATION OF NITRIDE FILM (Si₃N_{4.5}O_{0.7})

FIG. 19(a)

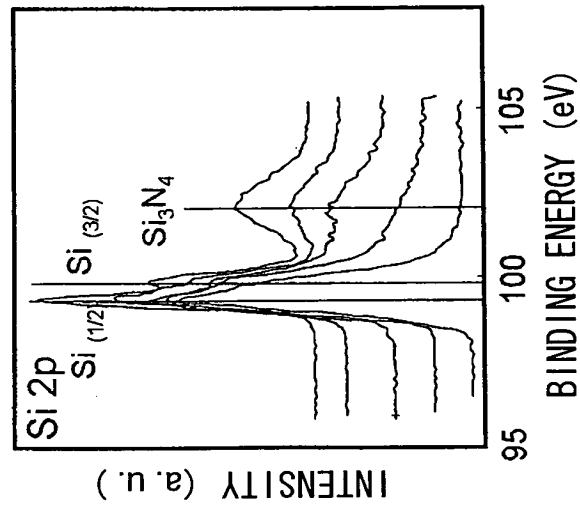
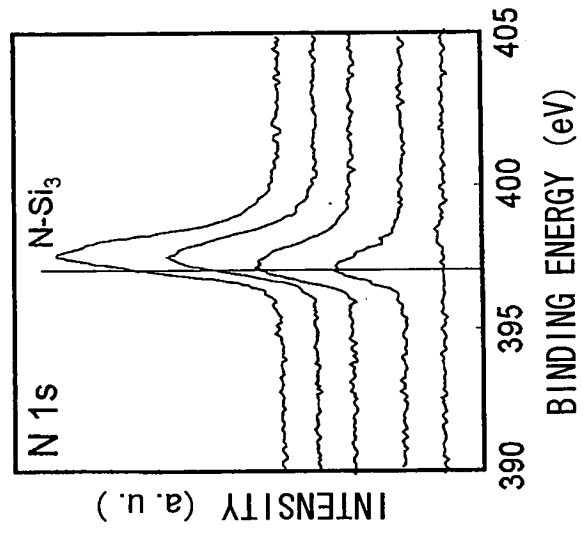


FIG. 19(b)



⇒ Si-N BONDING UNIFORMLY DISTRIBUTED

FIG. 20

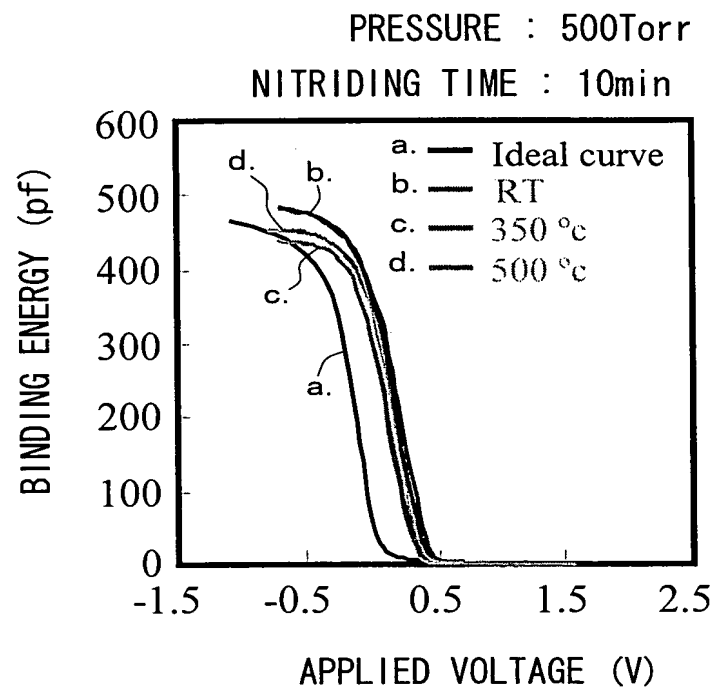


FIG. 21

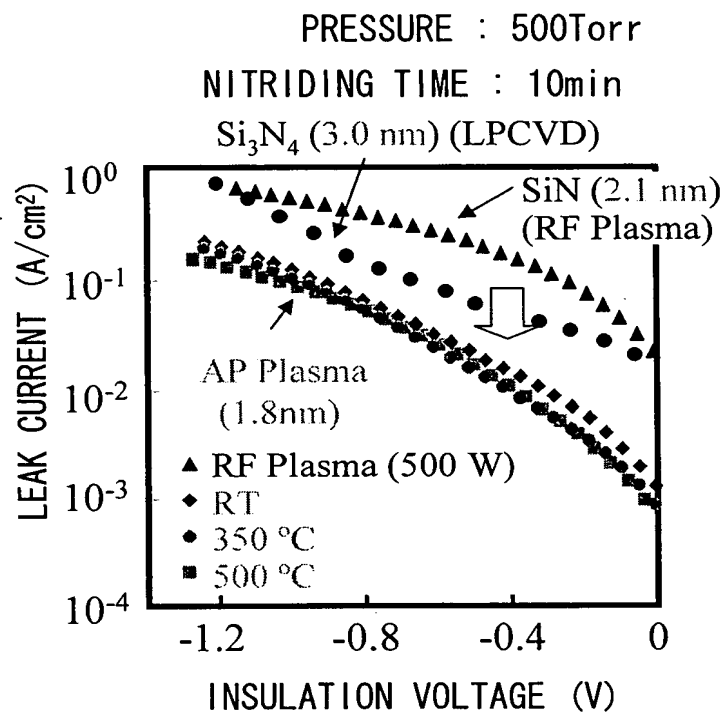


FIG. 22

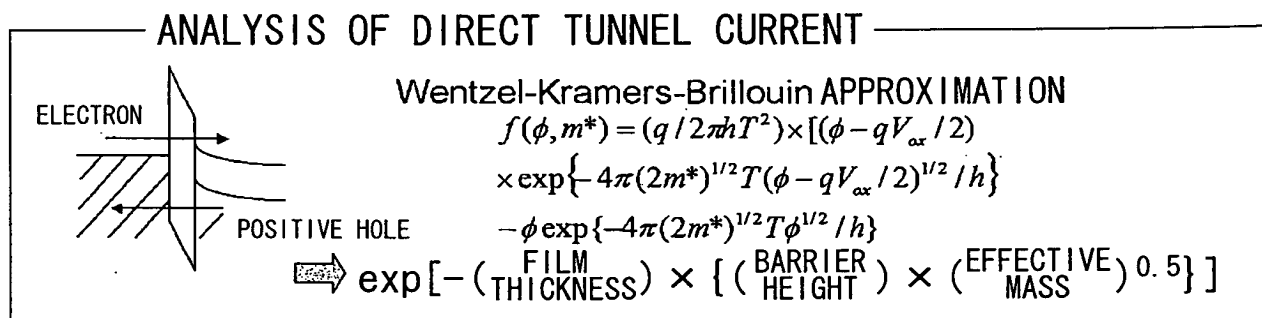


FIG. 23

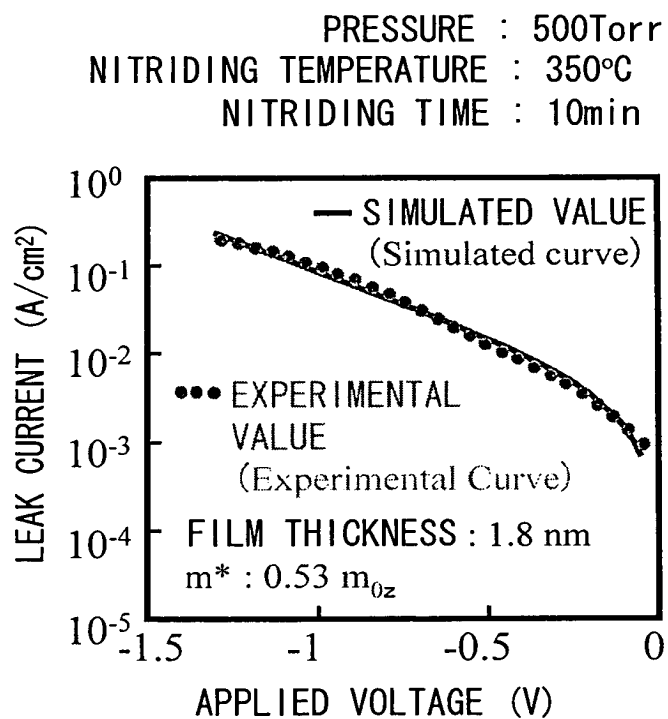


FIG. 24(b)

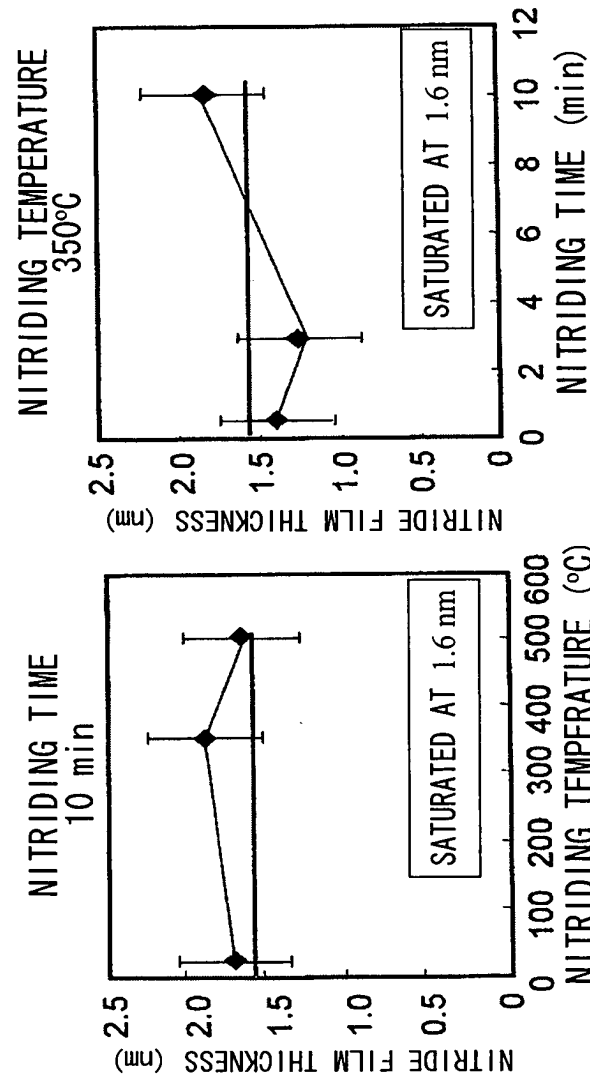
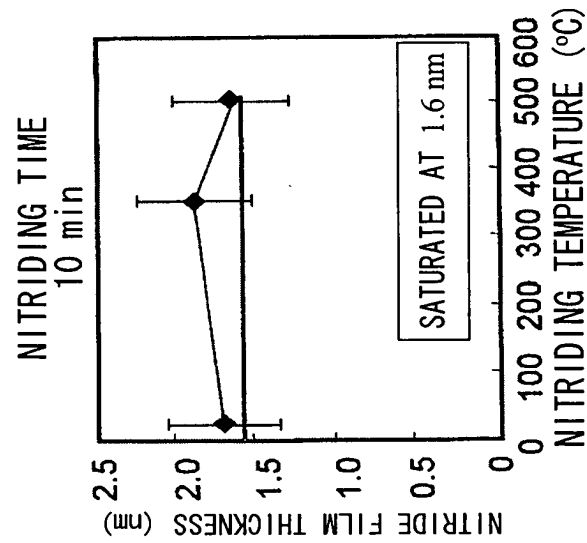


FIG. 24(a)



NITRIDING REACTION \Rightarrow NOT DEPENDENT ON NITRIDING TIME/TEMPERATURE

FIG. 25

NITRIDING TEMPERATURE : 350°C
NITRIDING TIME : 10min

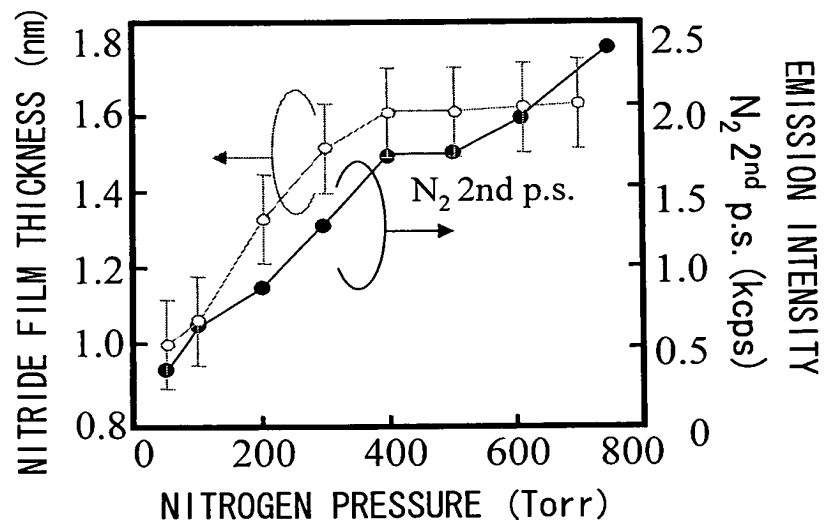


FIG. 26

NITRIDING TIME : 10min

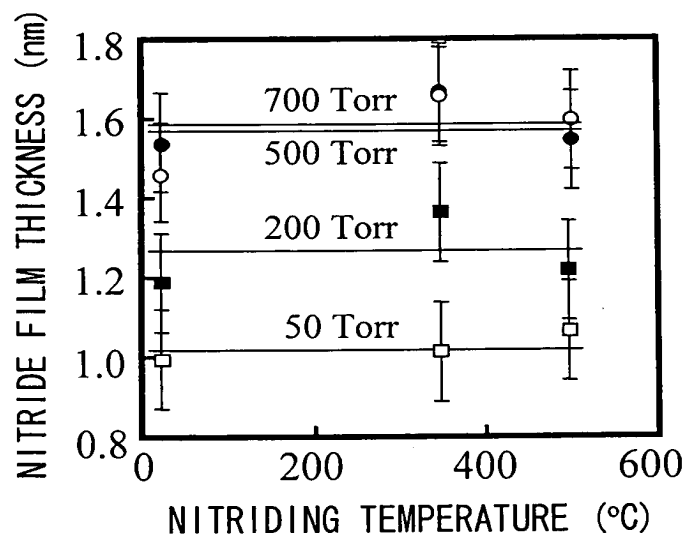


FIG. 27

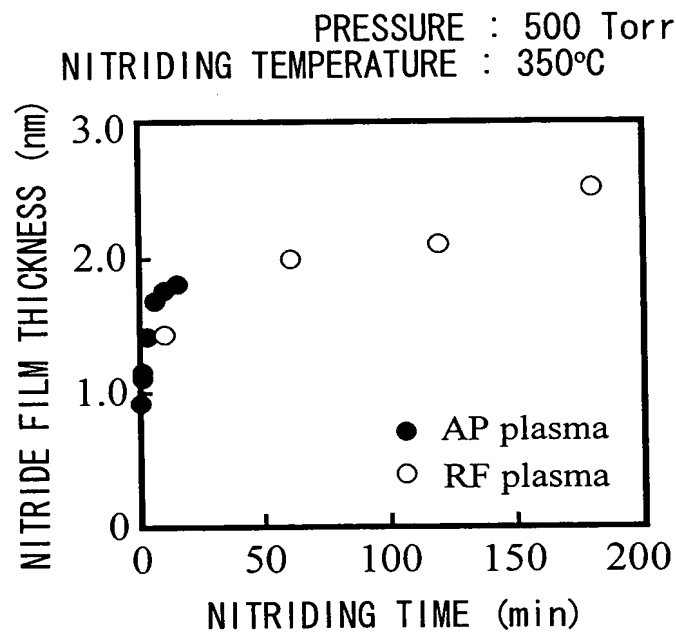


FIG. 28

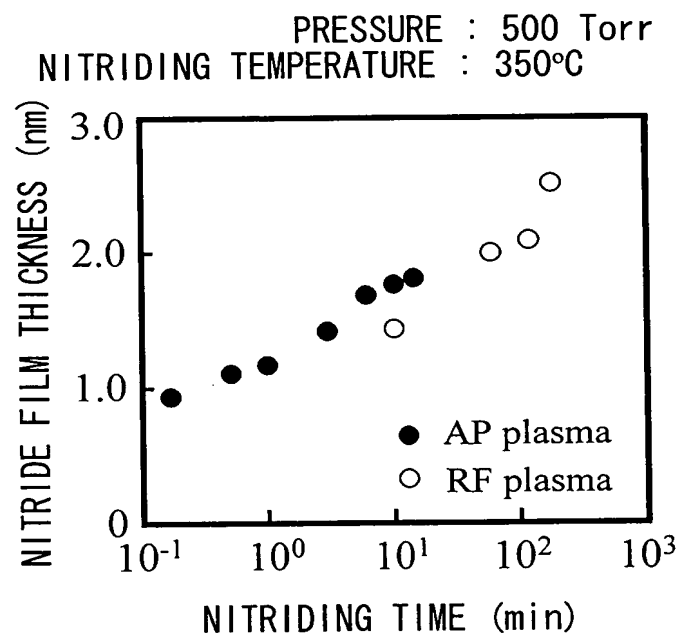


FIG. 29

ATMOSPHERIC PRESSURE PLASMA (AP plasma): PRESSURE : 500 Torr
NITRIDING TIME : 10min

RF PLASMA (RF plasma): PRESSURE : 1×10^{-5} Torr
NITRIDING TIME : 60min

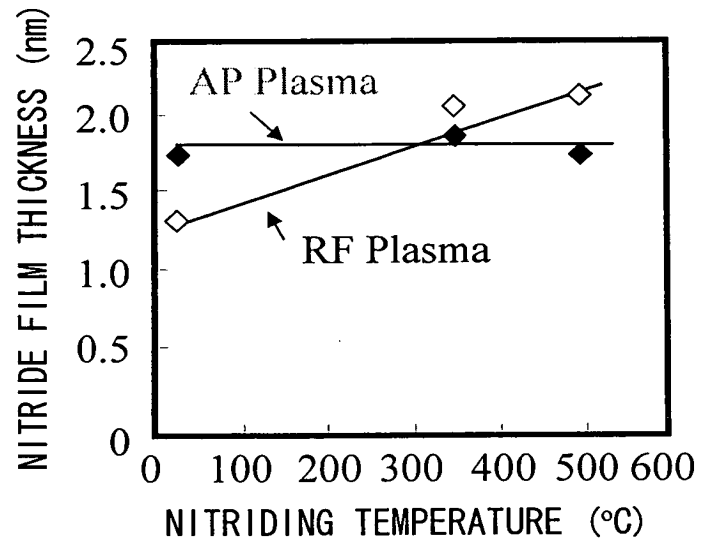


FIG. 30

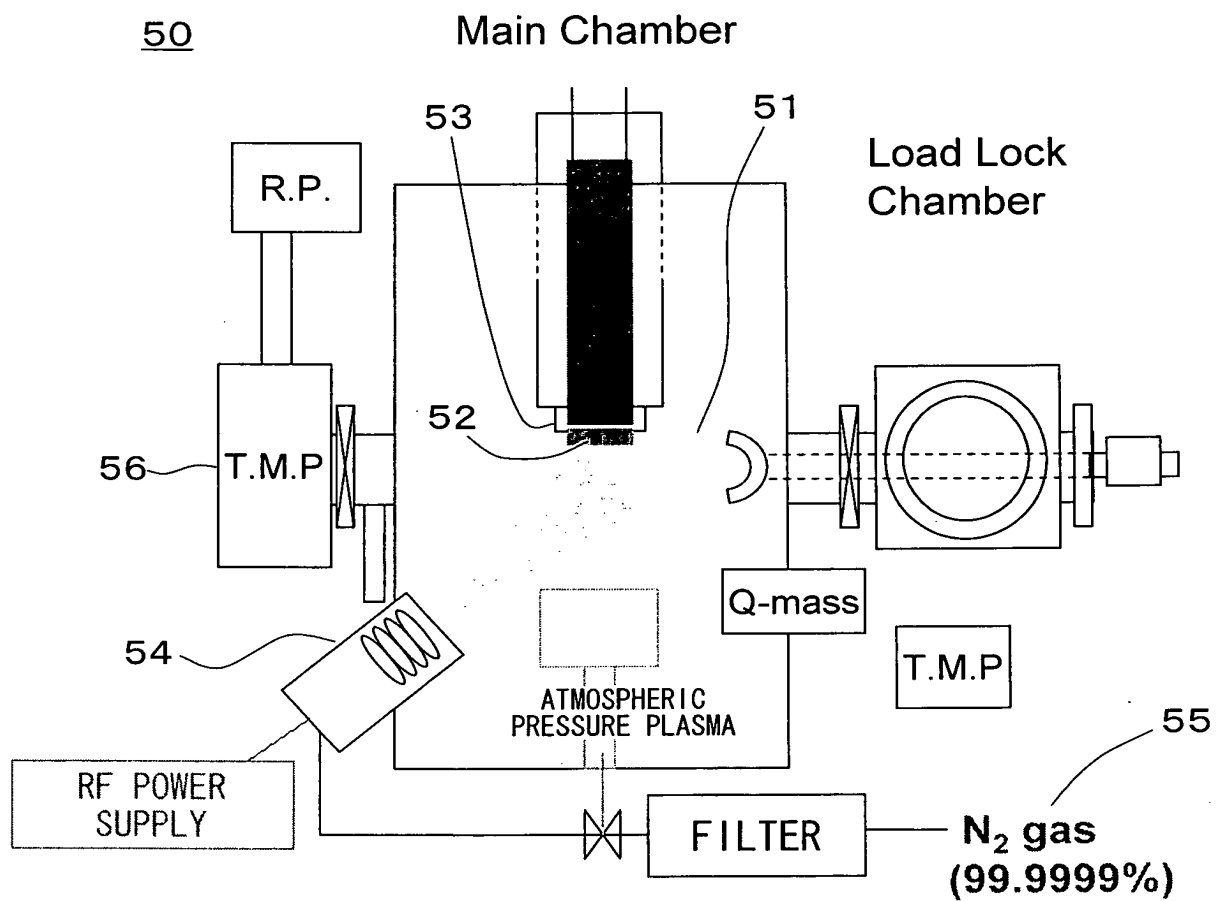


FIG. 31

.....
SUBSTRATE

Si (111)
.....

NITRIDING
TEMPERATURE

ROOM
TEMPERATURE

~500°C
.....

RF PLASMA

PRESSURE

1.0×10^{-5} Torr

NITRIDING TIME 10 min. ~ 180 min.
.....

ATMOSPHERIC PRESSURE PLASMA

PRESSURE

500 Torr

NITRIDING TIME 10 sec. ~ 15 min.
.....

FIG. 32

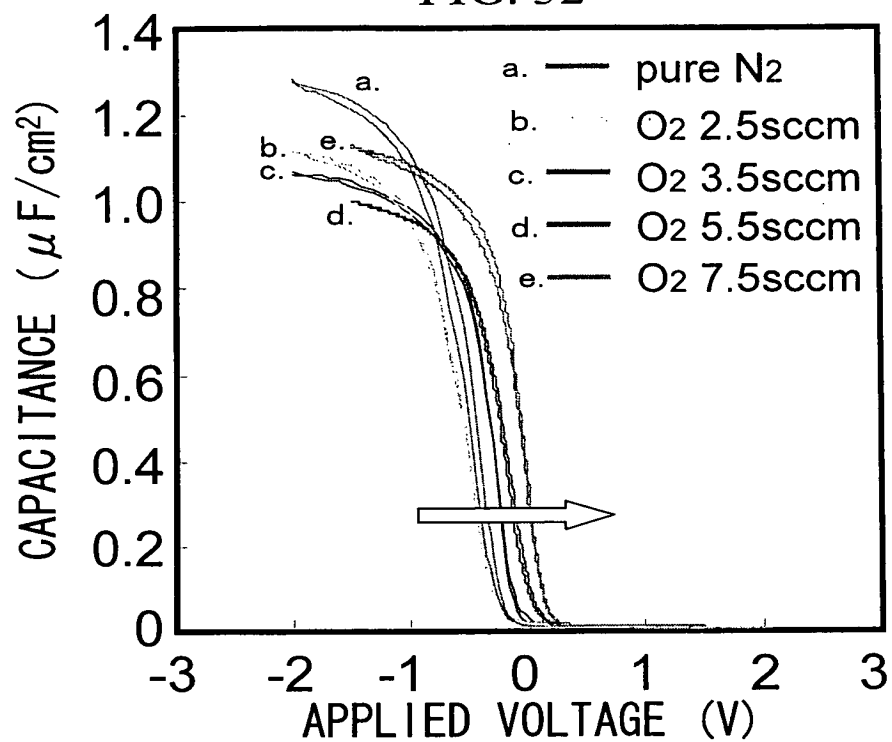


FIG. 33

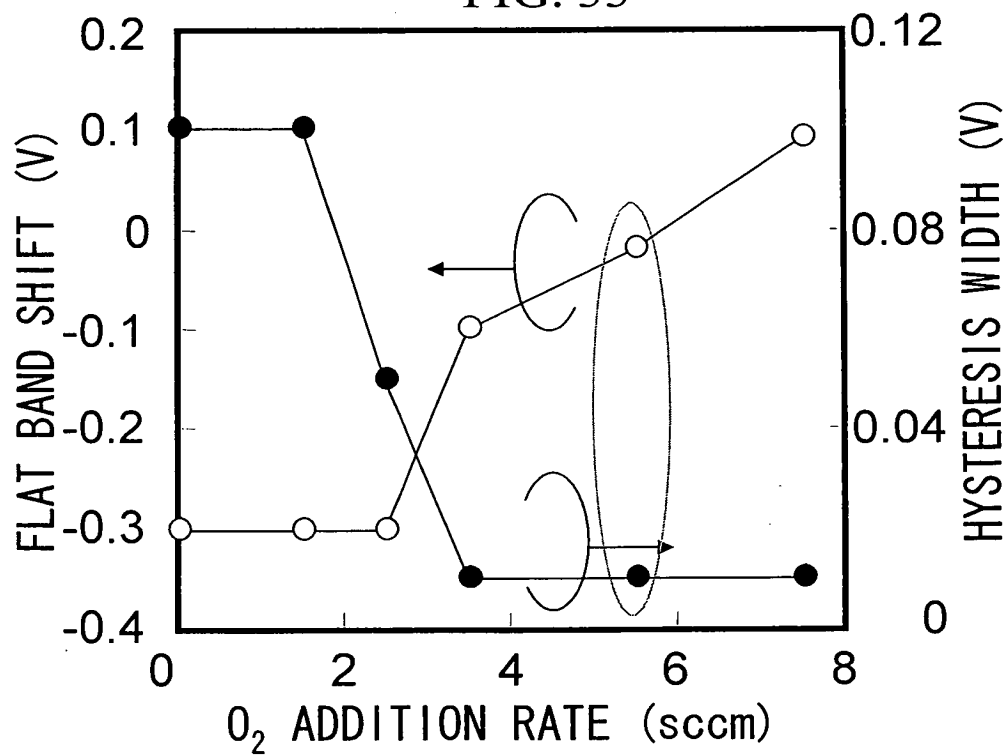
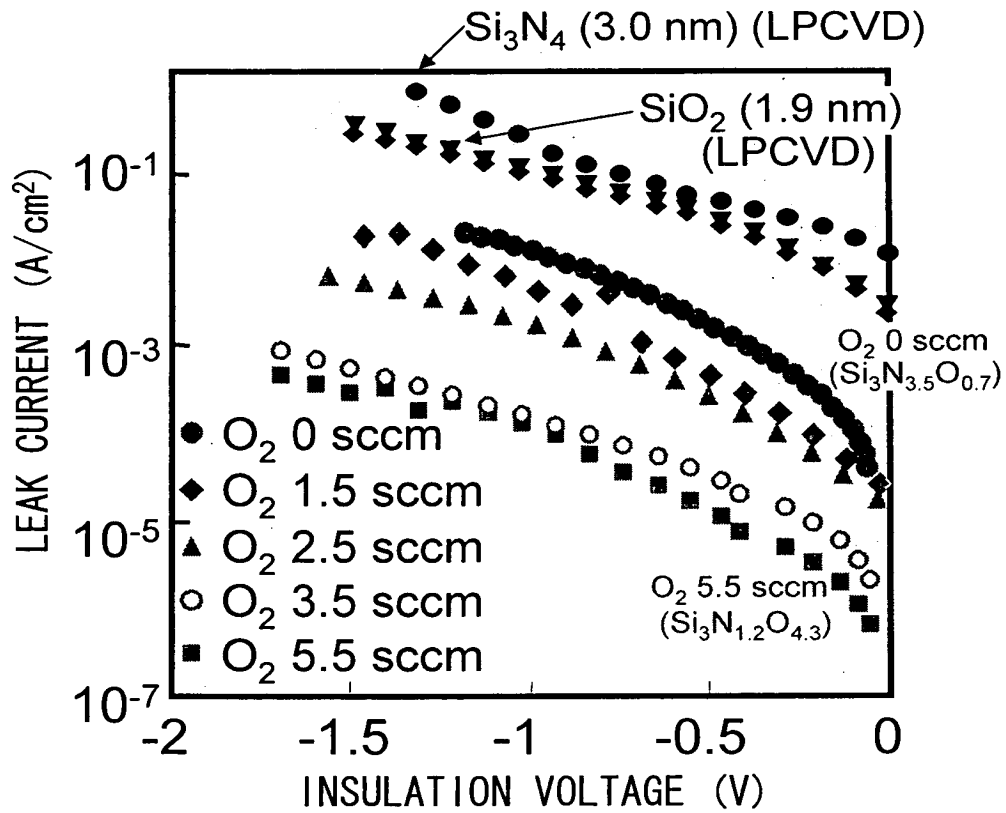


FIG. 34



Ref: K. Muraoka et al. J. Appl. Phys, 94, 2038

FIG. 35

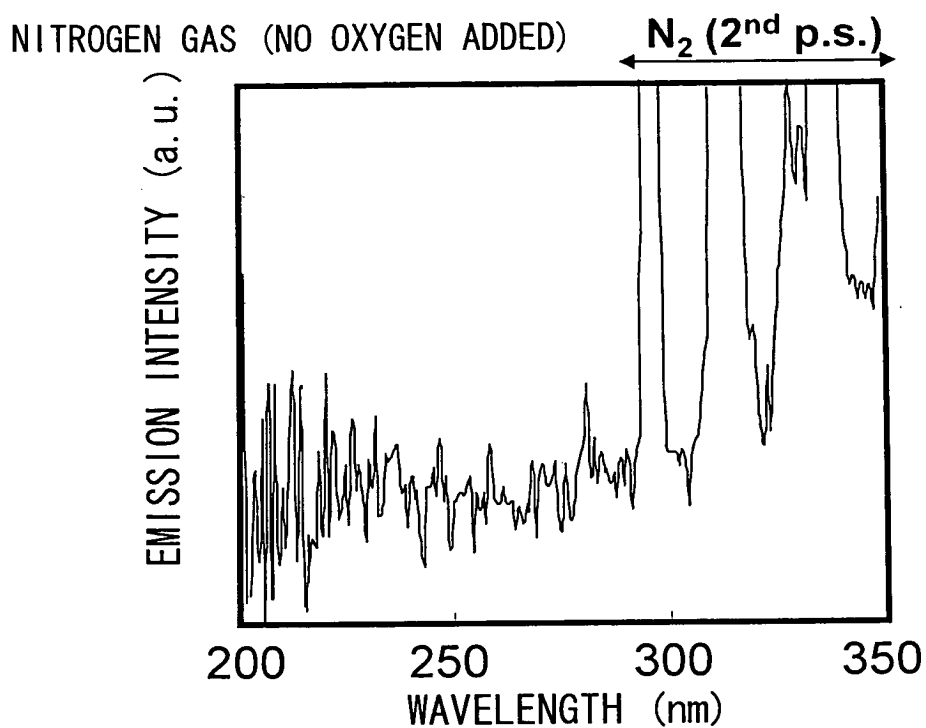


FIG. 36

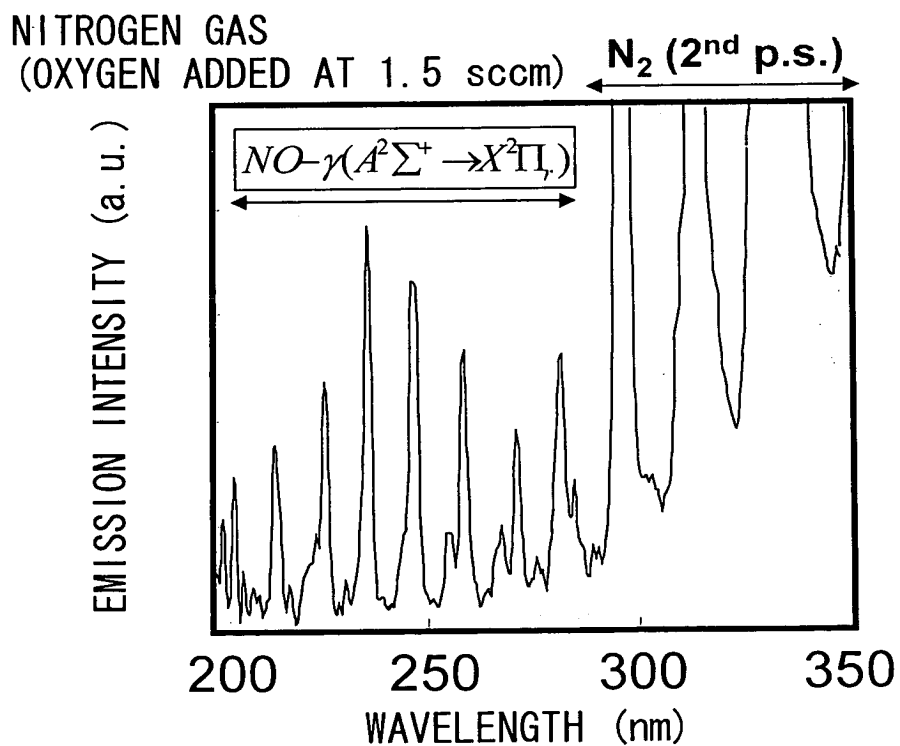


FIG. 37

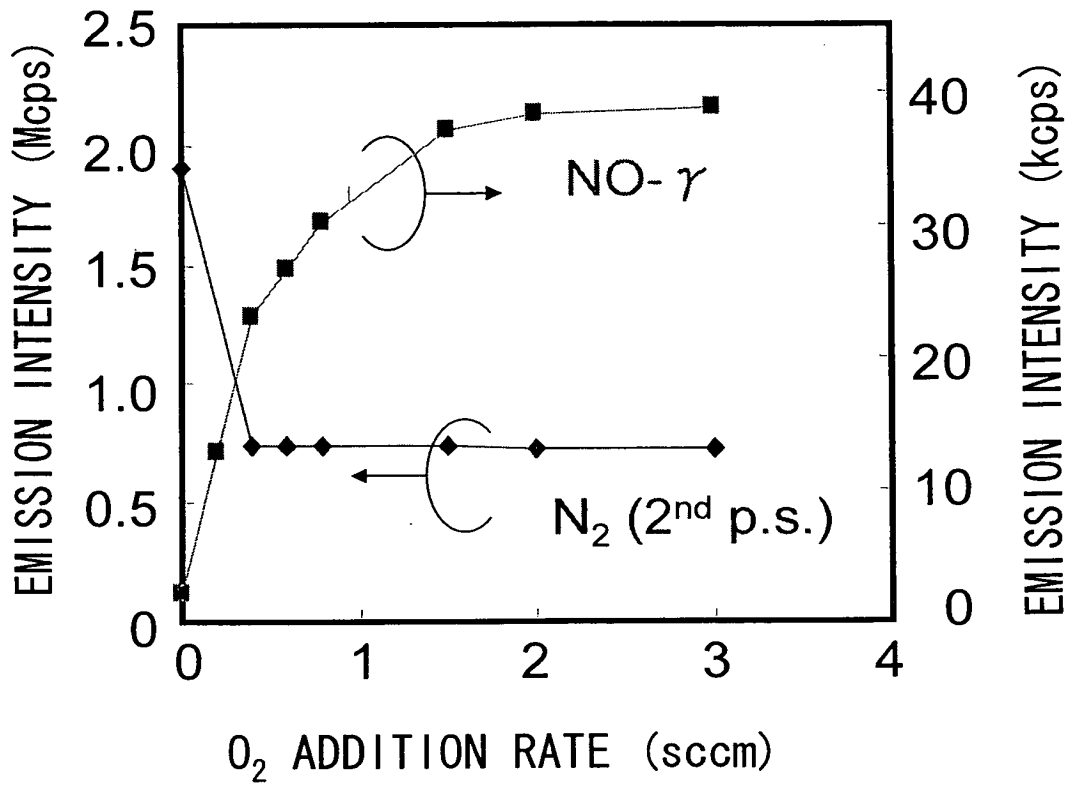


FIG. 38

NITRIDING TEMPERATURE : 350°C

NITRIDING TIME : 10min

